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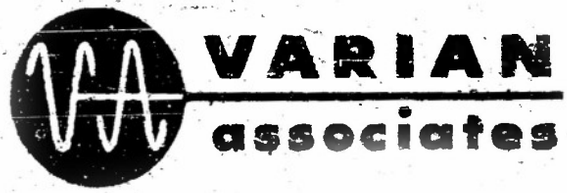

CONFIDENTIAL
SECURITY INFORMATION

VARIAN ASSOCIATES
ENGINEERING REPORT

COPY NO. 12
FEBRUARY 1953

INTERIM REPORT
13,500 MC KLYSTRON OSCILLATOR DEVELOPMENT

Period: 1 November 1952 thru 31 January 1953

Prepared for

Bureau of Ships Navy Department

on

Contract No. NObsr-49096
Index No. NL-490155

Prepared by:

Peter Kafitz

Approved by:

H. Myrl Stearns
Vice-Pres. and Gen. Manager

Sigurd F. Varian
Vice-Pres. for Engineering

John W. Clark
Sales Manager

PURPOSE

Varian Associates has undertaken the following work as specified in Contract No. NObsr-49096, Index No. NL-490155.

1) The development of a transmitting oscillator tube in accordance with Bureau of Ships Contract Specification SHIPS-T-37 dated 15 November 1949.

2) The furnishing of the following tubes.

a) Tubes of preliminary design, including electrical test and full characteristic data in JAN-1A form, in a quantity to be mutually agreed upon between Varian Associates and the Bureau of Ships, Code 836.

b) Twenty-five tubes of final design, including electrical test and full characteristic data.

3) Furnishing an engineering scheduling flow chart.

4) Submission of Final Proposed specifications, drawings, and test specifications in JAN-1A form.

5) Submission of monthly reports, as specified.

GENERAL FACTUAL DATA

The entire effort on this project during the past quarter has been directed toward the building and testing of the tubes required to complete the contract. As was mentioned in the last interim report, no further development work is planned.

The first group of V-28's was inspected by the Inspector of Naval Material. All appeared to be satisfactory in all respects except for the vibration test. This test involves a "mechanical noise tapper" which strikes the tube directly. Subsequent measurements have shown that this is an unusually severe test and imposes conditions upon the tube which will never be encountered in its use. For this reason a waiver has been requested.

No tubes were shipped during the period covered by this report.

DETAILED FACTUAL DATA

To date 20 tubes of the final design have been completed. All of these have been given a preliminary test by Varian to determine the power output, tuning range, and operating voltages and currents. Of the 20, 18 are satisfactory in these regards. The following table gives a summary of the data taken at 13,500 mc. Some of these data have been reported in earlier reports.

SUMMARY OF DATA TAKEN ON TWO-CAVITY V-28'S

(Final Type Tubes)

Frequency = 13,500 mc

Tube No.	Matched Power Out	Beam Voltage	Beam Current	Input Power	Remarks
60	14.4	3070	64	196	
61	13.8	3000	62	186	
62	14.9	3100	64	200	
63	13.6	2910	58	169	
64	13.3	3010	63	189	
65	15.2	3020	66	199	
66	14.4	3060	62	190	
67	----	----	--	---	gassy
68	13.2	3040	59	179	
69	10.7	2920	56	163	low power
70	11.6	2890	54	155	
71	16.8	2940	58	171	
72	17.0	3000	61	183	
73	15.9	2950	61	180	
74	20.2	2960	66	196	
75	19.0	3000	62	186	
76	17.8	2870	59	169	
77	15.8	3000	58	173	
78	19.2	2990	66	197	
79	17.6	2990	62	185	

Seven of the above tubes have been inspected by the Inspector of Naval Material. In addition to the previously mentioned tests, they were checked for a-m noise, electronic bandwidth, residual f-m, and f-m due to vibration. The tubes appeared to be satisfactory in all respects except the last, that is, in the amount of f-m caused by the impact from a mechanical noise tapper. This tapper is a Western Electric type 592C extension bell with the gongs removed. The clapper is made to strike the tube directly, and the f-m noise induced in the output signal is measured using a high Q wavemeter as an f-m discriminator.

The worst condition of all cases occurred when the tapper was applied along the axis of the tube, that is, when the clapper was made to strike on the top of the catcher assembly. The amount of f-m varied from 4 to 6 mc, peak to peak frequency excursion, over the group of tubes tested. The maximum allowable deviation is 1 mc.

As a means of checking the severity of the tapper test, several tubes of the group were given a standard vibration test of 6 g's over the frequency range of from 100 to 20,000 cps. The maximum peak to peak frequency excursion observed was approximately 350 kc, which compares favorably with other rugged tubes.

In addition an attempt was made to measure the acceleration caused by the mechanical tapper; however, this was not too successful. Estimates varied from several hundred to a thousand g's.

It is believed that the use of the tapper is an unrealistic vibration test and that it imposes upon the tube conditions which will never be encountered in its operational use. The Inspector of Naval Material has requested the contracting agency to delete this requirement or substitute a better controlled vibration test.

Actual expenditures during December 1952:	$3,604.71
Actual engineering man-hours during December 1952:	412
Actual expenditures during January 1953:	$2,489.00
Actual engineering man-hours during January 1953:	317.5

PROGRAM FOR NEXT INTERVAL

During the next period construction of tubes for delivery will continue. As soon as the waiver is received, the seven tubes already inspected will be shipped. The remaining tubes will be shipped as rapidly as they can be inspected.

It is planned to begin life tests on two tubes as soon as the equipment is available.

February 26, 1953

From: Varian Associates
990 Varian Street
San Carlos, California

Via: Inspector of Naval Material
P.O. Box 3364
San Francisco 19, California

To: See Attached Distribution List

Ref: BUSHIPS CONTRACT NO. NObsr-49096
Index No. NL-490155

Subject: Interim Report for Period
1 November 1952 thru 31 January 1953
13,500 Mc Klystron Oscillator Development

Attached hereto are 2 copies of the Interim Report on the 13,500 Mc Klystron Oscillator Development.

Very truly yours,

John W. Clark
Contract Administrator

JWC:WWC:ss
Encl. **Copies #11 and #12**

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Contract No. NObsr-49096 - Index No. NL-490155

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10	1	Commanding Officer Watson Laboratory Red Bank, New Jersey Attn: WLEOP-1A
11 - 12	2	Commanding General Wright Air Development Center Attn: WCESO2 Wright-Patterson Air Force Base, Ohio
13	1	Panel on Electron Tubes 139 Centre Street, Room 601 New York 13, N. Y. Attn: Secretary
14	1	National Bureau of Standards Washington 25, D. C. Attn: J. E. White
15 - 18	4	Bureau of Aeronautics Department of the Navy Washington 25, D. C. Attn: EL-54

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DISTRIBUTION LIST

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19 - 20	2	Director U. S. Naval Electronics Lab. San Diego 52, California Attn: A. H. Attebury
21 - 24	4	Bureau of Ships Department of the Navy Washington, D. C. Attn: Code 816
25	1	Inspector of Naval Material P. O. Box 3364 San Francisco 19, California
26 - 27	2	Bureau of Aeronautics Airborne Equipment Division Department of the Navy Washington 25, D. C.
28	1	Document Room, Project Lincoln (MIT) P. O. Box 390 Cambridge 39, Mass. Attn: Ethyl R. Branz
29 -32	4	Retained for use by Varian Associates.

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